On alternative smart cities: from a technology-intensive to a knowledge-intensive smart urbanism

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Abstract

Smart urbanism seems to be everywhere you turn. But in practice the agenda is an uncertain one, usually only partially developed, and often more about corporate-led urban development than about urban social justice. Rather than leave smart urbanism to the corporate and political elites, there are opportunities now for critical urban scholarship to not only critique how it is currently constituted, but to give shape to a globally-oriented alternative smart urban agenda. An ambition like this means taking the 'urban' in 'smart urban' much more seriously. It means foregrounding the knowledges, political priorities, and needs of those either actively excluded or included in damaging ways in mainstream smart urban discourses. We outline steps towards an alternative smart urbanism. We seek to move beyond the specific to the general and do so by drawing on radically different initiatives across the global North and South. These initiatives provide tantalizing openings to a more socially just use of digital technology, where urban priorities and justice drive the use – or lack of use – of technology.

Key words: urban geography, smart cities, Global South, urban policies, slums, mental health

Introduction

In the past few years, a number of critical pieces have been written about smart cities, moving the discourse beyond the self-congratulatory literature that was predominant until 2010. This work has deconstructed the discourse and ideology of smart urbanism (henceforth: SU) (Hollands, 2008; Kitchin, 2014; Söderström et al., 2014; Vanolo, 2014), analysed real smart cities through fieldwork in places as different as Dholera (Gujarat), Cape Town or Philadelphia (Datta, 2015; Odendaal, forthcoming; Wiig, 2015) and discussed alternative forms of smart urbanism with regards to corporate-led versions (Hemment and Towsend, 2014; Luque-Ayala and Marvin, 2015, early view).

Considering the ideological nature of the discourse around SU and its close association with corporate interests (Hollands, 2015), one may wonder if this is not enough. Shouldn't we as

scholars simply leave it there, having done the necessary work of critique? And, doesn't continuing to talk about smart cities mean talking the language of the largest IT companies, and thereby unwittingly allowing them to set agendas in urban debate?[1]

However, SU today is more than pure rhetoric: it has become a powerful and performative discourse, notably in the Global South. In Africa, it proliferates in new Masterplans and grand visions of urban futures (Watson, 2014a). In India, the SU narrative, supported now by the nationalist discourse of the Modi regime, is used as a means to justify land grabbing and dispossession (Datta, 2015). On the other hand, public intellectuals and activists, as our paper shows below, are trying to find ways of bending it so that it serves other interests than the ones represented by global business. In discourse and, increasingly, in practice, SU is a force driving urban change. We need to engage in the analysis of the variegated forms that 'real' smart urbanism takes on the ground, both in the urban policies of national governments and municipalities and in the grassroots initiatives and social movements that disturb, resist or create their versions of SU.

The dominant SU discourse is "supply orientated, usually concerned with growth and economic priorities and more formal modes of social organization" (Luque-Ayala and Marvin, 2015, early view, 8). It also promotes an apparently a-political or post-political view of urban development strategies (Söderström et al., 2014) paving the way for a corporatization of city governance (Kitchin, 2014). There is a tendency to present the 'urban' in 'smart urban' as a blank canvas upon which powerful sophisticated technology can simply be overlain and made to work in straightforwardly useful, new ways. There is little genuine commitment to social

[1] This is before we ask whether the critique is operating effectively: as Boltanski and Chiapello (Boltanski and Chiapello, 1999) put it a few years ago: "the main factor explaining the solidity of capitalism since the 19th c is probably its capacity to listen to critique".

and ecological justice here, and little critical thinking around how digital technologies might practically become embedded in the already exisiting worlds of urban life.

If critique is to develop alternative ways of thinking about and doing SU, then it is vital that we seek to redefine it as a pre-requisite for a continued critical scholarly engagement, i.e. for work that continues to discuss SU beyond the dominant categories crafted by IT corporations or suggested by research funding programmes such as Horizon 2020[2]. In order to open up the discussion to broader interests, to possibilities of dissent and democratic discussions on urban futures, we argue that we need to return to the original meaning of smart and move from a technology-intensive to a knowledge-intensive smart urbanism. In other words, a redefined smart urbanism should be grounded in places – actually existing cities – with their specific populations, resources and problems, rather than start with technology. We agree with Hollands (quoting Hoornweg) when he argues that "the 'real' smart city needs to start with the city and its attendant social problems, rather than looking immediately to smart technology for answers" (Hollands, 2015, 63), but we would push this claim further still to say that SU needs to be understood as contributing to already existing struggles in urban places, in other words: alternative SU needs to begin with ordinary urban places, knowledges, and needs. Our position should not be misread as technophobic: when we say SU should begin with knowledge and place, it does not mean that it should exclude technology. The argument is rather that technological solutions should, when needed, be shaped by place-relevant forms of knowledge.

[2] See in particular call H2020-SCC-2015: http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2148-scc-01-2015.html

To redefine SU as knowledge-intensive, we should, we suggest, ask three very simple questions and use them both to confront dominant visions of SU and to generate alternative SU. First, who frames what we need knowledge on? Second, who provides knowledge for urban development strategies? And third, what type of knowledge is needed? The presence or otherwise of technology, and the nature of that presence, then follows the identification of what the urban problem is and how the people are living those issues – ordinary and marginal urban residents in particular – would want to frame and address and actively respond to that problem. This means beginning not with technology, nor with smart, but with urban knowledge.

To substantiate this argument, our paper unfolds in two steps. First, we examine the different dimensions of a knowledge-intensive SU, contrasting it with dominant corporate-driven logics. Drawing on theoretical work on urban learning and knowledge-production (Lindblom and Cohen, 1979; McFarlane, 2011) we discuss how this knowledge should be framed, by whom it should be produced and what aspects of the urban it should concern. Second, we relate and develop this general discussion by exploring alternative forms of knowledge production that revolves around smartness in cities of the Global South and the Global North. We conclude with a discussion regarding the new alliances between urban studies and urban policies within a redefined SU.

Given the breadth of existing and potential alternative SU initiatives, it is important in an intervention like this to avoid focusing on one set of examples. The research challenge before us is to chart and support multiple different ways of stretching and developing genuinely progressive forms of SU. For this reason, we illustrate our claims through radically different urban contexts: informal settlements in different parts of the global South, and psychic

disorders in parts of the global North. If an alternative SU is to take shape, it must be able to speak beyond particular cases and instead develop through finding general principles that can guide it globally. As such, the presence of an unlikely set of empirical combinations in one paper actually becomes more not less valuable. While the *content* of alternative SU will vary considerably according to context – that, in fact, is part of our argument – the *forms* of alternative SU can hold stable across multiple places and issues. This does not imply that we propose an alternative *model* of SU. To do so would mean repeating one of the mistakes of corporate-led SU. Instead, we develop here basic features of an alternative position that can operate across different empirical cases. Indeed, it was through a series of conversations that we came to see that our own explorations of what an alternative SU might look like have – to our surprise, initially – much in common. Both cases are concerned with the ways in which marginalized groups learn the city, and with how, in turn, an alternative SU might be learnt through focusing on how these groups learn and differently articulate their needs. In making this argument, we both found that it was people, place, knowledge and politics that mattered most to successful SU, not technology. Technology is only useful insofar as it supplements people, place, knowledge and politics (by politics here we mean the priorities, often neglected or misunderstood, of marginal groups themselves). Therefore, our cases will explore how technology and knowledge can complement each other in alternative SU.

We are not the first, of course, to suggest the formulation of an alternative SU. There are other recent calls, discussions and suggestions in that direction. Luque and Marvin (2015) for instance caution us not to over-emphasize differences between dominant and grassroot approaches but rather to examine and compare critically their rationalities. Leontidou (2015) suggests we lift out SU from its neoliberal context and connect it to translocal grassroot activism and creativity, which today often draws on the resources provided by ICTs. Hollands (2015) reflects on alternatives by discussing four initiatives in different cities where

technology is not the solution in itself, and where the focus is rather on people and cooperation. Our approach is to build on these discussions and extend these arguments by suggesting a redefinition of smart urbanism as a knowledge-intensive urban development strategy.

Redefining smart urbanism

Smart urbanism is a loosely connected set of confluences between data, digital technologies, and urban sites and processes. The promise continually sold is of the digitally-enabled data-driven, continually sensed, responsive and integrated urban environment. Central control rooms, such as IBM's Rio control room (Luque and Marvin, forthcoming), are imagined as constantly monitoring the distributed city, thereby bounding it as a manageable totality through real time data: spaces that integrate the governance of infrastructures in ways that are constantly up to date and actionable. Densities of people, traffic, goods, even weather – such as in flash flooding, in Rio's case – are managed here (so the claims go) through a new urban informatics, increasingly premised on algorithms that articulate and represent large data sets, and which are inter-related through integrated governance based on new ways of seeing urban space.

Recent critical scholarship identifies a series of risks in dominant formulations of what SU consists of: the obfuscation of the negative effects of IT on cities (Hollands, 2008), a return to the failed utopias of 20th c. high modernism (Greenfield, 2013), the rise of technocratic governance (Kitchin, 2014), the discrimination of 'non smart' citizens (Vanolo, 2014) or the prioritization of IT networks over other more urgent needs in municipal agendas (Söderström

et al., 2014). Analyses of actually existing SU (Shelton et al., 2015) describe the regimes of exception and processes of land dispossession accompanying the implementation of SU (Datta, 2015), the processes of depolitisation of urban redevelopment management (March and Ribera-Fumaz, 2014), or the priority given to the attraction of global business (Wiig, 2015).

Other reports describe situations where different versions of SU oriented towards economic growth or social development are in tension, follow each other and overlap (Odendaal, forthcoming; Townsend, 2013). In Brazil, for example, alongside more corporate-driven SU initiatives, there are community-oriented efforts that direct digital mobile technologies to health monitoring in favelas[3]. These more ambivalent analyses of actually existing SU are both related to the various political orientations of municipalities (Ching and Ferreira Jr, 2015) and the proliferation of grassroots movements that either explicitly react to SU policies in their city[4] or develop creative solutions that can be characterized as smart.

More broadly, these reports indicate that SU is ever-more an unstable concept. To be sure, dominant versions, such as IBM's (McNeill, forthcoming), are still the most visible in the public sphere, but SU increasingly signals vastly different initiatives and strategies. As critical British journalist Paul Mason (2015) writes of digital technologies more generally, the creative use of information – despite the best efforts of powerful corporate interests, their legal teams, and their monopoly tendencies – can include experiments with new uses that exceed control by capital, even if these too have their own hierarchies and complicities with hegemonic capitalist actors (Beer, 2015). Part of the opportunity for reconstituting the agenda of SU lies

[3] See, for instance, the social economy start-up PlataformaSaúde: http://www.plataformasaude.net.br/#!about-us/c4yk.
[4] See for instance the Hyderabad Urban Lab (http://hydlab.in/blog/notes/commentary/will-the-real-hyderabad-please-stand-up/) on which more below.

in researching and developing how a wider range of actors are using digital technologies to pursue a more inclusive city.

So where next? Steps towards an alternative knowledge-intensive SU

Where then should we go from here? In their critical research agenda, Luque-Ayala and Marvin (2015, early view) point to three priorities, amongst others: developing multiple ways of theorizing, examining alternatives, and doing comparative research. Our contribution is to rethink the core of SU and examine how this reconceptualization might be relevant to grasp the power of alternatives.

Efforts to reconceptualise SU are not new. For instance, Caragliu et al. (2011, 70) argue that the conceptualisation of SU has been too narrow and that "the stress on the Internet as 'the' smart city identifier no longer suffices". They suggest a theorization that includes 6 axes: "smart economy; smart mobility; a smart environment; smart people; smart living; and, finally, smart governance" (Ibid.). Their aim is to put more emphasis on social inclusion, social capital and sustainability. We welcome this, but we also need to identify the core of SU. If it's not IT, then what should it be? We aim also to go beyond the list-like frameworks for alternative SU. A checklist is precisely the sort of argument that corporations have the capacity to digest. It is a form of critique that they can easily absorb, because the corporate discourse on SU is designed to be expansive and encompassing.

As Kitchin (2014: 3) notes 'smart city vendors such as IBM and Cisco have [already] started to alter the discursive emphasis of some of their initiatives from being top-down managerially focused to stressing inclusivity and citizen empowerment". Corporate visions of SU can

potentially turn any (new) theme into indicators and data, possibly also to captors or sensors to make it amenable to software analysis. This is exemplified by the cybernetic vision of SU promoted by IBM and its vision of cities as being composed of 9 systems or Cisco's 4 layers of SU.[5]

This cybernetic imaginary is functional to promoting and selling smart urban technologies, and adding new themes does not itself challenge it. If we want to overcome the trap of technocratic governance and the technology-push ethos, common in engineering sciences and of course in IT corporations, a more radical critique is needed. This critique should not evacuate the role of technology, which is central to the genealogy of SU (Goodspeed, 2015), but displace it. This is not to say either that all those involved in SU in corporations such as IBM steadfastly believe in the sole power of high-tech or even develop narrowly technology-focused projects; but rather that these corporations' storytelling can lure local governments into simplistic solutions. If we consider the three questions we raised in the introduction - who frames what we need knowledge on, who provides knowledge for urban development strategies, and what type of knowledge is needed? – these soutions are simplistic because they are removed from the knowledges, lives and priorities of ordinary residents. Moving beyond technology-push postures means opening up a knowledge-intensive space for thinking new, creative, smart initiatives and strategies where technology might be enabling but not the starting point and where solutions can often be low-tech.[6] ~~This requires, we argue, a redefinition of smartness as a knowledge-intensive rather than a technology-intensive vision of cities and their development.~~

[5] http://www.ibm.com/smarterplanet/ca/en/smarter_cities/overview/;
[6] See the arguments of the engineer Philippe Bihouix (2014) on the necessity of low-tech solutions (allowing repairability and collective use) in the perspective of a technically sustainable future.

Knowledge is etymologically at the root of the word 'smart'. It may have become the standard move to reach for the Oxford English Dictionary, but it's important to keep firmly in mind that the adjective smart is a very old word related to two semantic fields. The first is smart as something sharp, stinging, cutting. Smart describes here the properties of an object. The other set of meanings relates to qualities of speed, intelligence and neatness. Dominant SU discourses – given that they emerge first and foremost from companies who, after all, are selling commodities – generally push the second conception, and connect smart etymologically primarily to technology rather than to intelligence and knowledge.[7]

But simply arguing for a knowledge-intensive conception of smart urbanism does of course not lead us very far either. Any city official involved in urban development would contend that her or his strategy is knowledge-intensive. In corporate-led smart urbanism, IT companies frame the knowledge that is needed. IBM with it's 9 (or 10 pillars)[8] for instance. Such framing presupposes that cities across the world can be envisioned in the same way. One of the consequences is that there is little or no conception of the urban at work in these discourses: of the histories, concerns, knowledges, and trajectories of what is already there. The urban is reduced in the flattest possible ways, presented as a surface – often in the form of glitzy images of the tech city yet-to-come – and implicitly rendered both secondary to technology itself and to powerful visual representations (see here, on the use of smart fantasies of African cities, Vanessa Watson's [2014] work).

[7] We are aware of the limits of etymological argumentation – as exemplified by Heidegger's (ab)use of etymology as ground truths, for instance in texts such as 'Building,dwelling, thinking' (Heidegger, 1971). What we pursue here is a kind of 'strategic etymologism' as a form of critique .

[8] Water and energy were in previous versions of IBM's smarter cities vision considered together, but are now seen as separate urban systems.

The three questions we raised in the introduction may be straightforward, but we have found them useful and instructive in critically evaluating both mainstream and alternative SU. To take but one example in relation to the first question of who frames what we need knowledge on: in previous work one of us has looked at the variegated categories of public space in Europe, Africa and Asia and shown how framing public space with concepts from elsewhere may lead to misunderstandings and problematic policy decisions (Söderström, 2014; Söderström and Geertman, 2013). The way knowledge on cities is framed cannot be left to traveling corporate consultants but should rely on processes of grounded knowledge (co-)production. This itself can take multiple different forms. Consider for example the framing of knowledge through models of deliberative democracy and urban forms, such as those in that were once so strong around participatory budgeting in Porto Alegre (Baiocchio, 2003; McFarlane, 2011), through to more revolutionary neighbourhood-based alliances such as those in Ecuador (Harvey, 2008).

The second question - who provides knowledge for urban development ? – is of course closely related to the former. In the dominant SU narrative, there is a worrying return to high modernist forms of exclusively expert-driven urban planning (Söderström et al., 2014). Important therefore is to remobilise critical planning theories of the 1970s and beyond as they precisely were seeking alternatives to modernist-functionalist planning postures. The theory of usable knowledge (Lindblom and Cohen, 1979) is particularly relevant in this context. Lindblom and Cohen suggested that the production of usable knowledge requires the articulation of three forms: lay or ordinary knowledge, expert knowledge and knowledge generated by the interaction between experts and ordinary citizens. The question of whose and what kinds of knowledge and learning counts in the production of urban life has become an increasingly important area of debate in critical urbanism (e.g. McCann and Ward, 2011; McFarlane, 2011; Robinson, 2006; Roy and Ong, 2011; Watson, 2014b). A critical focus on

knowledge for alternative SU can shift attention from the formation of expertise and authority to the tacit and tactical imaginations engendered by urban inhabitation.

Our emphasis, then, is less on data and more on knowledge. We are replete with data about cities, as charts, lists, maps, rhythms, intensities, numbers, and so on – an increasingly "encyclopaedic renditions of things" counted and curated, a "polytheistic pantheon of urban life, understood as a great 'meanwhile'" (Thrift, 2014: 3). This prevalence exacerbates a confusion between data and knowledge, and between data-mining and knowledge production, that blurs the distinction between collecting data and interpreting what they mean. An implicit assumption of corporate-led SU regarding knowledge is that there is available data on what we need to know and that the essential questions are data-mining, the construction of inter-operable data sets and their connection and interpretation through algorithms. However, as the word indicates, stat(e)istics have historically always reflected what the State wants to know and hence been the product of a highly selective and power-laden exercise (Desrosières, 2002). This is true for statistical data routinely compiled by different levels of state administration but also for the more local-specific choice of new data produced by myriads of sensors.

In contrast, an alternative SU will entail a different kind of learning, a learning that foregrounds actually existing urbanism and the kinds of learning that ordinary residents use and need to improve their lives and places. Learning here is about two steps that follow the three questions posed above (McFarlane, 2011). First, identifying the knowledges and needs of those conventionally on the margins of the techno-fetishism of SU discourses – especially the urban poor and marginalized - as vital to any smart iniative that works for urban justice, and insisting that technology follows that identification, rather than being dropped into the

urban environment. And second, it entails understanding the knowledge-forms of ordinary urban residents, i.e. the ways in which those residents learn what matters in their urban environments and how that mattering might be supported. Both these moves position a politics of knowledge and learning as centrally important to the production of alternative SU. It is political because the question of whose knowledge and which forms of learning matter most is the critical starting point of any SU initiative.

In forging an alternative to SU, then, we do not seek to abandon the term 'smart' altogether. Instead, in connection with an older sense of smart that relates to the generation of sharp insight, we ask from where does this knowledge come, and who frames it? We argue that a critical notion of smart must be rooted in the urban context, in the knowledge generated through the needs, desires and realities of ordinary lives, especially marginal groups so often at the margins of urban planning. Rather than leave smart to powerful corporate interests, or to a technofetishistic illusion of a real-time neatly ordered city, but the place-based, experiential and very often neglected urban realities of people living on the socioeconomic edges of urban societies. We set our case in relation to informal settlements and mentally vulnerable groups, and examine initatives that generate digitalized knowledges that put people and place before technology and which point to a critical project of populating an alternative SU.

In contemporary urban situations a number of initiatives show that some areas, such as slums, are blank spots on our city maps and that the government lacks informations about critically important aspects of urban life. As we will show, there has been a surfeit in recent years of attempts to count, map, survey and document life in informal settlements through digital technologies, especially smart phones, websites, GPS, and multimedia broadcasting. Indeed,

it is here more than anywhere else where marginal urban spaces in the global South have encountered SU. We will suggest that here are the seeds of an alternative SU that reflects the knowledge needs of poor urban communities, although we do not suggest that this is a straightforward process (for example, the knowledge generated is not immune to uses that do not support the needs and advancement of the urban poor). Drawing on another research context concerning knowledge production with persons with mental health problems in Switzerland, we then show that alternative SU needs to be developed across the North-South divide and to mobilise not only a wide range of actors but also various approaches to data and knowledge production. Both sets of examples open out a new politics of learning for an alternative SU.

Digitising slums

There are two immediate key trends through which alternative SU can grow in relation to informal settlements. The first is to do with *sensing urban infrastructures*. For example, there is some potential in the use of sensors to measure water flows through pipes that trigger alerts if water use is outside of an expected normal range (McQuillan, 2014; http://www.libelium.com/smart_water_wsn_pipe_leakages). Such data can be made publicly available and as such could be used by residents and activists to hold states, utilities and private providers to account. Mapping water networks by distribution and volume may allow, for instance, activists to more effectively combat state claims that adequate water is being provided, or suggestions that it is the poor rather than say the state and/or inadequate maintenance that is to blame of low water supplies (Graham, Desai and McFarlane, 2014). There is a gulf between these types of developments and actual application within informal settlements, and while there may be potential here, we need to be mindful that such developments could do more harm than good.

For example, ethnographic research on water in informal settlements has shown that not only is the provision of water supplies closely linked to political and social differences based on gender, religion, class and caste, but that closer formal state control – for example through legalizing water in 'illegal' neighbourhoods – can have very uneven results, serving to improve conditions for some while entrenching exclusions for others (e.g. Truelove, 2015; Bjorkman, 2015). It is vital then that any provision of smart sensing technologies in this context be handled with extreme care, and rooted in a strong understanding of the spaces, lives, politics and economies of informal settlements. Producing data and making it public is not an unqualified good, and the implications are not always predictable, and an alternative SU requires a careful, critical sensibility throughout the process. The most likely route through which smart technology might facilitate the constituting of more commonable resources like water in informal settlements is if interventions *begin with the place and not with the technology*. Moreover, the questions of who produces the data and how, and who interprets the data and how, are vital here, otherwise the potential for these kinds of initiatives to succeed is limited from the start – we know this from the long history of debates on knowledge and development (Satterthwaitte and Mitlin, 2014; McFarlane 2011; Watson, 2014b). A commitment to learning is central –learning about the social and political dynamics of urban space, to see the world through the knowledge-concerns of those living on the margins of, in this case, infrastructural provisions, and to see technology from the priorities and hopes of residents themselves.

The second engagement of SU in informal settlements follows on from this point in that it takes the place of the informal settlement to be central: *the digitalization of slum data*. Smart technology in the context of informal settlements is, at the moment, largely a question of up-to-date data, and this connects to a wider set of initiatives around urban open-source urbanism (eg Corsín Jimenez, 2014; Nemer, 2013; Mehta and Yadav, 2016). This takes a variety

of forms, but the emphasis across different initiatives is the production of real time maps and the use of data to build partnerships for improved infrastructure, services, and housing (McQuillan, 2016). In addition, these initiatives often seek to forge alternative social representations of informal settlements in order to challenge stigmatized narratives and images. 'Smart' here is less about intelligent infrastructures and more about producing digital data to improve basic infrastructures in ways that reflect the needs and learning of marginalized urban communities. At the same time, these initiatives may constitute a foundation for future smart city developments.

It is no accident that data generation is at the centre of emerging smart city efforts in informal settlements. One of the key challenges in the provision of infrastructure, housing and services to informal settlements – aside from the question of political will on the part of the state or the pressure on land from speculative investors (Davis, 2003; Goldman, 2011; Sassen, 2014) – is a lack of data (Joshi et al, 2013). Two examples will serve to illustrate the sort of initiative we have in mind: infrastructure audits by the Social Justice Coalition in Cape Town, and mapping and enumeration 'Know Your City' initiative of Slum Dwellers International with the Santa Fe Institute (and there are other relevant examples not discussed here, including Transparent Chennai [http://www.transparentchennai.com/about/] or the Hyderbad Urban Lab's work on mapping and analyzing a variety of issues including transport, gender and toilets [http://hydlab.in/blog/notes/interns/public-toilets-in-hyderabad-an-audit/]). A key distinction of these inititiatves is that it is the residents, working with activists and sometimes technicians, who produce the data and interpret it, rather than the external if well-meaning consultant or professional.

The Social Justice Coalition (SJC) is a movement that campaigns and researches on rights and provisions for the urban poor in Cape Town. A significant part of the movement's work has

been focussed on sanitation conditions and budgeting in townships, especially in Khayelitsha where it is based, and in informal settlements (Odendaal, 2015). In order to produce data through which to combat the city council's claims about sanitation provisions in Cape Town – claims which are typically very positive about the level of provision and maintenance – SJC decided to audit sanitation conditions in Khayelitsha, including the level of provision, the spatial distribution of toilets the level of maintenance, the conditions in which maintenance staff are forced to work, and the views of residents. The surveys, which involved residents and activists inspecting toilets, were then produced on digital maps and tables. Alongside this, SJC is developing a system of online reporting of sanitation conditions that supplement these online maps, whereby residents can use smart phones to upload information about dysfunctional toilets, inadequate maintenance, and related issues, to what becomes a powerful real time data set. One of the consequences of this data is that SJC has been able to question the city's data and budgeting allocations in a more vigorous way, much to the chagrin of the city authorities. Locallly produced data is politicized by residents and activists, some from the area, some from outside, but in an approach committed to the priorities and concerns of the residents and the place. Knowledge becomes part of a political process with the urban state – here, again, an image of what an alternative SU might entail.

The Slum Dwellers International 'Know your City' initiative, which is run with researchers at the Santa Fe Institute, is ambitious and exciting, and aims to provide interactive data on 6000 informal settlements. This is a whole set of census data collected by groups of the urban poor about their own neighbourhoods - demographic, spatial and economic, from infrastructure provisions across space to livelihoods – which can be used to inform upgrading programmes with up-to-date data and to develop partnerships with local states. Like the SJC data, the strength of this data as a negotiating tool is that it speaks the language of the state. It is more difficult for the state to ignore quantitative and mapped data, especially in the easily movable

form of digital maps, than it is to ignore more qualitative calls for social inclusion. For SDI activists, such data is vital to developing partnerships where the actual realities of the lives of the urban poor are placed at the centre of discussions, and in an accurate, real time format. While SDI may lack the more radical politics of SJC, there is a common commitment here to producing, politicizing, and interepreting knowledge through the priorities and concerns of local people and places, even where that learning involves the support of outsiders.

It is important to point out here that while data developed through digital technologies across all three of these cases has a kind of agency both in its form (it can easily circulate) and in its impact (it can have a visual power that influences thinking and practice), the politics of the data is shaped less by the data itself and more through the conceptions of the urban political at work in the different movements. There is a particular conception of *incremental politics* at work in these two cases, even if the form of that politics differs across the initiatives: a *rights-based* politics of citizens holding a state to account (SJC), and a long-term process of *partnerships between states and an entrepreneurial urban poor* (SDI). Across these different initiatives is a commitment to incremental, real time data that can be tinkered with and politicized. In this sense, the form of data digitalization here mirrors the broader practice of incrementalism that characterizes informal settlements more generally (McFarlane, 2011; Simone, 2008; Silver, 2014; Pieterse, 2008), here in the context not of adjusting water or electricity connections or of gradual alterations to housing but of data collecting, sifting, translating and fusing. But there are also resonances between these initiatives and more explicitly mainstream smart city strategies, a kind of *infrastructural mirroring* between mainstream and alternative.

On the one hand, there is the prospect here that the incremental logic of slum urbanism carries forward into a more radical politics towards an urban commons through more inclusive

urban policy and practice, of what Edgar Pieterse (2008: 6) has called 'radical incrementalism': "Surreptitious, sometimes overt, and multiple small revolutions that at unanticipated and unexpected moments *galvanize into deeper ruptures* that accelerate tectonic shifts of the underlying logics of domination and what is considered possible". And yet on the other hand, there remains a question about what is specifically at work here that marks these different interventions out as constituting alternative examples of SU. While the actors, practices and aims at work here are largely distinct from more corporate strategies of SU redevelopment, there are certain characteristics that are shared across mainstream and alternative strategies.

In particular, at work across mainstream and alternative smart strategies are shared principles of transparency, information-sharing, visibility, real-time engagement, coordination, and responsiveness. Moreover, initiatives such as the two discussed are not necessarily immune to becoming later absorbed by states in ways that detach them from residents concerns and fold them into more technocratic or politically regressive agendas. Indeed, while SDI emphasizes co-production of knowledge and urban priorities between residents and states, some critiques of the movement have argued that in practice the political priorties of residents are sometimes compromised or displaced by the agendas of the state (Huchzermeyer, 2011; Watson, 2014b; McFarlane, 2011).

However, this infrastructural mirroring is itself a potential route through which digital politics generated from the informal settlement might help shape the larger smart city agenda. And it's here that we find the openings of an alternative SU. In the two cases, there is a political starting point: that of the different forms of the active, continually informed, responsible citizen. The notion of enhancing citizen action through data is important to both movements. But this is a different kind of knowledgable citizen from the 'smart citizen' implicity in mainstream SU (eg see Vanolo, 2014), because the knowledge that matters here is that

learned by residents and activists living and working in informal settlements, struggling to provide basic amenities like housing, water and sanitation, and seeking to push new extensions of services and to develop more equal relationships with municipalities that often hold them at arms length and marginalize their ways of learning the urban world. There is the opening here, then, of not just an alternative SU, but an alternative smart citizen, rooted in the learning concerns of informal settlements, where the use of technology is only ever to supplement already identified ways of knowing and commitments to urban social improvement.

There are three key points for thinking through the potential of digital technology to the constitution of alternative SU in which the informal settlement is a central rather than peripheral consideration. First, all three examples illustrate the need to start with the neighbourhood and not with the technology. Technological approaches that are layered into informal settlements that don't understand the everyday life of the place, the struggles and needs or the residents, and the long term trajectories of incremental development, are likely to miss the target or, worse, hit the target in ways that are wholly inappropriate to local needs. The consequence is that these practices are always more than data gathering: they entail knowledge creation of people, places and issues that emerges from the concern people have about urban challenges and opportunities.

Second, while digital technologies have sometimes unexpected agency, they are more likely to be *shaped by* conceptions of urban politics than to shape urban politics themselves. This is a reminder of the specificity of digital technology – it can be useful, but ultimately the political preoccupations that residents and activists themselves hold are likely to trump whatever seductive technology is presented: it is people, politics, knowledge, and place that matters most. And third, following on, there are lessons from social movements such as the three

above in how to place smart technology as part of the process of urban social improvement. In particular, the commitment to slow, incremental learning through groups and networks, and to positioning technology as one amongst several different practices that work together in (re)constituting SU as a more socially-oriented knowledge-intensive set of initiatives. Again, given the politics shaping these processes, the lines between mere data gathering on the one hand, and the creation of knowledge on the other, become blurred.

Focusing on knowledge about and interventions in informal settlements could suggest that alternative forms of SU are adapted to the resource and data poor cities of the Global South while 'mainstream smart' is adapted to cities in the Global North. This is not the case. The continuous production of relevant and usable knowledge is an issue everywhere, as we now explore in relation to psychosis and the city. Our next section looks at research aiming to provide such knowledge in a particularly resource and data rich context: Switzerland. It also shows that urban data and knowledge that do not mirror those traditionally produced and used by the state are crucial to an alternative SU. Again, our focus is with groups on the margins of mainstream SU, groups who are included in SU in ways that too often centralize technology over the knowledge concerns of those in question. If it seems unlikely to think about, in one paper, the knowledge of residents of different informal settlements and the knowledge of those suffering from pychic health questions, then this is precisely our point: to build a more socially just conception of SU, alternative SU needs to focus on radically different routes from those well travelled by the likes of IBM and Cisco. In other words, we need – as a heuristic move in order to imagine the characteristics of an alternative SU – to investigate the absence of data and how they can be co-produced comparing most different cases rather than cases that we might otherwise prioritise for comparison simply because of their commonalities (Robinson, 2011).

Exploring urban stress

Persons with mental health problems constitute a marginal group in cities because they encounter social exclusion more often than inclusion and frequently have to compose with precarious livelihood situations (Knowles, 2000; Parr, 2008). For persons with a diagnosis of psychotic disorder, in the spectrum of schizophrenia in particular, marginality is also related to the mere fact of living in cities. As recent medical research has shown, urban upbringing and living is a source of stress and has an intrinsic impact on the onset of non-affective psychosis (e.g.: Kelly et al., 2010; Krabbendam and van Os, 2005; Vassos et al., 2012). Drawing on an ongoing research project in which one of us is involved (Söderström et al., forthcoming-a), we argue that, here as well, a blank spot exists in urban knowledge and that this spot cannot simply be filled by data- and techno-centric procedures.

To affirm that mental health in cities is an unchartered territory might seem curious, given the amount of work published on this issue in the social sciences and in psychiatry, especially since the 1990s.[9] However, there is still very little knowledge enabling an understanding of urban stress and the mechanisms through which urban living plays a role in the onset of psychosis. Existing studies on the city/psychosis nexus in medical research are predominantly epidemiological. Such studies use available statistical (or produce) data to track correlations between descriptors of urban areas (density, social deprivation, etc.) and the presence/absence of persons with mental health problems therein (e.g. Allardyce et al., 2005; Kaymaz et al., 2006; Kirkbride et al., 2012). Causal relation are then explored on this basis. The assumption is that 'exposure' to pathogenic factors and immersion in unfavorable environments are determinants of psychic disorders. Various research teams have thus recently produced data by looking at patients' conditions before and after going out in

[9] See references in the previous paragraph for some key work.

potentially stressful urban areas (Ellett et al., 2008; Freeman et al., 2014). In this perspective, data-mining and analysing connections between datasets can, in line with the promises of mainstream versions of SU, lead to new hypotheses and understandings of the role of environmental factors in psychosis.

However, such methodologies have two serious shortcomings that limit their capacity to grasp the mechanisms explaining how complex urban milieus have an impact on vulnerable persons. First, they analytically decompose the urban into discrete variables and do not allow us to investigate the urban as encountered by persons with (actual or potential) mental health problems: in other words, to see the urban as a milieu assembling a multiplicity of characteristics. Second, they assume the existence of linear causal links between features of the urban and the development of mental health problems. Hence, the above mentioned experiments with exposure. What remains out of the picture is the agency and biography of persons with mental health problems. Therefore, epidemiology is at pains to provide a processual understanding of how people and the urban interact in ways that may or may not be problematic for persons with mental health problems. However, a series of recent studies are exploring intersections between psychiatry and the social sciences beyond epidemiology (for a summary: Fitzgerald et al., 2015).

In this context, and in line with psychiatric research advocating a 'first person' approach to psychosis (Lysaker and Lysaker, 2008), our research develops an experience-based approach relying on mixed methods (from video-recorded go-alongs to a survey) (Söderström et al., forthcoming-a). This approach aims to capture what matters for this specific marginal group, to use our previous phrasing. Rather than assuming in line with mainstream SU that adequate data is stored somewhere waiting to be treated, we consider, on the one hand, that

knowledge about persons with mental health problems' relation with the urban is distributed among different actors and, on the other hand, that it must be produced by *in situ* experiments. Therefore, the co-production of knowledge between persons with mental health problems, psychiatrists, case managers and geographers is crucial in the research. The interaction of these different perspectives is necessary to produce 'usable knowledge'. To produce biographical and situated knowledge, narrative interviews and video-recorded go-alongs are of particular importance (see figure 3). They are the means to chart these other blank spots on the map of cities than the slums of Nairobi and to create processes of learning among people involved in mental health care. Forms of technology in the broad sense of the term – for instance, for the recording and analysis of videos – are thus involved in the analysis. But, technologies in the more specific sense of SU, such as automated data capture and analysis through sensors and software, are not useful at this stage, because we first need a careful description of how persons living with a diagnosis of psychotic disorder experience the city in their everyday lives.

With these methods we are grasping both situations of stress that may have played a role in the onset of patients' illness and ways of dealing with it: how smart persons with mental health problems navigate the city, avoid stressful atmospheres and search for zones of sensorial and existential comfort (see also: Bister et al., forthcoming; Duff, 2015). With regards to the specific question of the environmental factors in psychotic disorders, the central point here is that the factors of stress described by mainstream medical research are respecified by the results of the study. Let us take the example of density, recurrent in medical literature as a pathogenic factor and which could be used in a technology-intensive version of SU where the knowledge of marginal groups is not mobilized as an indicator for the location of mental healthcare facilities.

Instead of being seen as having the same effect on all persons with psychosis, density appears in our study to be problematic primarily for persons where psychotic disorder is related predominantly to biological rather than family and social circumstances. Density is also unbundled by this approach as demographic density, described by the interviewees as problematic, rather than density of constructions. Finally, instead of an external causal factor, density appears as an element that can be experienced both as a protective and a stressful factor in the daily urban lives of persons with mental health problems (Söderström et al., forthcoming-b). These observations put into question the implicit linear causalities of epidemiological methodologies and indicate that relations between the urban and psychosis differ in relation to persons' biographies and practices. They also indicate that therapeutic and planning strategies need to be fine-grained and specific to groups of patients with differing backgrounds and ways of life.

In terms of alternative smart urbanism, this ongoing research is more generally indicative of three issues. First it shows, contra the focus on data-mining, that data (and a fortiori knowledge) is on many important questions insufficient or inexistent. There is insufficient knowledge on the relation between mental health and the urban or, to name but another example, between children and public space. Such knowledge cannot be simply gained through data-mining, but must be produced if we want to support a smart urbanism in the service of variegated urban populations rather than a small group of highly skilled 'smart citizens' (Vanolo, 2014). Second, a knowledge-intensive SU needs to draw on a large number of different sources. Usable knowledge needs to be co-produced: governmental or municipal statistics are framed in ways that limit their relevance for urban management and development. Expertise on urban matters, contra the principle of centralized urban cockpits

or control rooms, is distributed among various actors, including slum dwellers and persons with mental health problems. And third, not only should knowledge be considered as distributed but also as related to different viewpoints or postures: both 'third' and 'first' person perspectives - to use the terms relevant to our research on psychosis. In other words, mirroring statal forms of data and data production can be a fruitful strategy when aiming to improve living conditions in slums, but alternative SU also necessitates other knowledge production strategies. Counting elements, geo-localising them are procedures that do not suffice when the knowledge that is needed is relational, tacit, embodied and bound up with painful memories as in the case of the urban dimensions of psychosis. This is not an exception of course: in many other cases as well, such as violence on women, crucial aspects of urban well-being need to be understood by other means than the reductionist models of techno-push versions of SU.

Conclusion

Our aim in this paper is to contribute to the emergence of alternative SU by charting approaches in radically different contexts. Rather than leave smart to the corporate elites, the critical purchase of our intervention is to argue that an alternative SU can be generated through foregrounding smart in the lifeworlds of different marginalized groups in the city. An alternative SU must embark on a dialogue that brings together seemingly unlikely combinations in the city: not the neat algorithms of IBM and Cisco, or technofetishistic promise of a real-time, seamlessly integrated city totality, but place-based, experiential and largely neglected urban knowledges of residents in precarious contexts. The project of building an alternative SU must entail a search for the defining features of a vision of SU based on such knowledges and not for an illusory alternative *model*. Vital to this strategy the need to consider the three questions and two steps we outlined in the first part of the paper in relation to any given SU initiative. These questions include: Who frames what we need

knowledge on? Who provides knowledge for urban development strategies? What type of knowledge is needed? Two steps follow: first, identifying the knowledges and needs of those conventionally on the margins of the techno-fetishism of SU discourses – especially the urban poor and marginalized – as vital to any smart iniative that works for urban justice, and, second, understanding the ways in which those residents learn what matters in their urban environments and how that might be supported.

We have used two cases regarding slum mapping and mental health as laboratories to flesh out three central principles of alternative forms of SU: starting with the neighbourhood, producing usable knowledge and shaping technologies politically. In mainstream SU, data-collection, -mining and -treatment technologies are the founding stones of urban management. However, situations across cities vary widely, and the priorities for both analysis and interventions need to be grounded in the specificity of places. While in this paper we have examined mapping slums and providing basic infrastructures as vital for many cities in the Global South, we are not suggesting that these issues do no apply to the poor urban areas in the North, from refugee camps and homeless groups to urban squats and economic/political occupations of urban space. Conversely, while we have examined mental health in relation to cities of the Global North, they are of course issues that are global in scope.

It may be, of course, that there is scope to learn across these different examples of alternative SU – indeed, it was the similarities and differences between the two cases discussed here that led to this paper. Building an alternative SU will require more and not less of these kinds of 'unlikely' comparisons and juxtapositions, in order to push exploration of different ways of approaching and doing alternative SU research and intervention.

The aim of such an endeabour is the production of usable knowledge, one that is not reducible to either existing statistics or ad hoc expertise and research on specific issues. As our research on mental health shows, it needs to combine distributed sources of knowledge and viewpoints on urban living. This form of knowledge is produced by activists and social movements in and on slums for instance, but also by researchers in urban studies. It is crucial for the development of alternative SU that such knowledge is scaled up and doesn't remain in the neighbourhood or in the circles of academic publication. Work by social movements such as SJC or SDI can of course reach a wider audience and make a difference through the use of smart technologies in the traditional sense of the word (smartphones, social networks, blogs etc.). Important here are the possible 'politics of the encounter' (Merrifield, 2013) between gatherings and actions in places (neighbourhoods, squares, streets, debates in municipalities) and how these emplaced issues and actions are connected to concerned others at a distance through IT. On the academic side, alternative SU needs the further development of public urban studies that co-produce knowledge with citizens and particularly with marginal groups as well as the reconstruction of alliances between urban studies and urban planning, two worlds that have drifted apart in many countries.

Finally, alternative SU should of course not be technology adverse. However, instead of technology-push strategies of urban management, a knowledge-intensive SU should strive to shape technology to put it in the service of social improvement. The failed introduction of smart meters in the Netherlands a few years ago was due to the fact that issues of privacy had been overlooked and therefore to an insufficient social shaping of technology. The need to balance the role of technology and knowledge is crucial to an alternative SU. As our example of smart sensing infrastructures shows, to socially shape technology is a process that needs to be subtly attuned to the specificity of places if we want to promote social justice.

These general principles of an alternative knowledge-intensive rather than technology-intensice SU are not simple intellectual speculations: they are enacted by activists and scholars in many cities in the world. However, for the moment they correspond to whispering and barely audible voices in the world of SU. SU is first and foremost a rhetoric battle-ground or, as Jazeel (2015) puts it, a representational strategy. A strategy, as Datta shows, which is very successful amongst young educated Indian middle-class people for instance. Now, compared to the glitzy pictures and techno-imaginaries of mainstream SU, work on mental health or slum mapping may not appear quite so glamorous. But therein is part of the problem. SU as constituted by IBM and co is all glamour, technology and noise – when it comes to the 'U' part of SU, we find that there is a purposefully very thin conception of the urban. Purposeful because it is useful for corporations selling SU packages to depict the city as a flat arena awaiting their latest technological expertise, rather than as a complex multiform of different political and knowledge agendas and radically distinct needs that present profound challenges for urban social justice. This paper is an attempt to produce alternative starting points and openings for SU, that refuse to leave it in the hands of profit-churning multinational corporations and their simplistic imaginaries. It is an attempt to make other voices more audible.

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